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Will the Fourth Industrial

Revolution come to Spain?

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If you think that a robot is unlikely to replace you in your job, perhaps this article will prove you wrong. Your opinion might be based on the fact that, in the past, automation of the economy was limited to repetitive tasks such as mental calculation (calculators), copying texts and images (computers and printers) and cleaning (dishwashers).¹ However, forthcoming technological improvements will permit the automation of non-repetitive tasks that, to date, are the exclusive domain of humans. This article analyses the impact of such changes on the labour market, considered by some experts to be the Fourth Industrial Revolution.

A robot's behaviour is governed by an algorithm; i.e. by a list of procedures established in advance by a human programmer. For example, you can instruct your computer to sell 100 shares only if they go above 50 euros. Traditionally, for a robot to carry out a task a human programmer had to understand the sequence of steps necessary to carry it out and be able to specify them clearly. However, recent improvements in the sensory and processing capacity of machines, together with the development of big data and artificial intelligence, are allowing automation to spread to almost all kinds of non-repetitive tasks such as driving vehicles (the

Google driverless car) and medical diagnosis (IBM's Watson robot). Thanks to big data robots can make use of a large database to test and learn which algorithms work best. Moreover, they can share their experiences and thereby learn from the errors and advances made by others. For example, at the Memorial Sloan-Kettering Cancer Center of New York, IBM's Watson robot provides diagnoses and treatments from an extensive database of medical reports and scientific articles. Consider also Google's car, which shares the information from its sensors with a highly detailed road map, specifying the exact position of streets, signs and obstacles, to decide in real time whether to turn, brake or accelerate according to what other cars and pedestrians are doing.

Technology has advanced so much that a study by McKinsey estimates that, today, 45% of the tasks existing in the US could be automated.² But we must not confuse tasks with jobs: a job or a profession is made up of many different tasks such as social interaction or physical exercise. To evaluate the impact on employment we must analyse how many tasks from each profession are at risk of being automated, which is precisely what two professors from Oxford University have done, namely Carl B. Frey and Michael A. Osborne.³ Their analysis identifies three groups of tasks which technology will still not be able to carry out in the next two decades: perception and manipulation in unstructured environments,⁴ creative intelligence (making a joke) and social intelligence (persuading someone). According to the relative importance of these three types of task, Frey and Osborne calculated the probability of each profession being computerised.⁵ For the US they produced a list with 702 professions and the probability of computerisation associated with each of them. If we convert their US classification to the Spanish case we can estimate the effect on a list of 485 professions in Spain. The first table shows examples of professions according to the risk of automation.

As we have already mentioned, it is estimated that technology is already capable of automating skilled professions (see the risk faced by accountants, financial analysts and economists), while those in which human interaction and creativity are more important (family physicians, musicians) are the most protected. This is also illustrated by the first graph, where we have classified professions into nine

large groups. Scientists (creativity) and managers (social interaction) face little risk while office workers are concentrated in the high risk group.

On the whole, according to our estimates 43% of the jobs that currently exist in Spain have a high risk (with a probability higher than 66%) of being automated in the medium term while the rest of the jobs are shared equally among the medium risk (between 33% and 66%) and the low risk group (below 33%).

However, we must not confuse the potential to automate the economy with the disappearance of jobs. Technology destroys professions but not the opportunity to work. Automation of the professions we know today offers the chance to redirect the nature of work, releasing workers so they can dedicate themselves to new activities in which they can develop all their potential, as exemplified by the vacuum cleaner and washing machine relieving people from housework. Most workers spend a large part of their time doing tasks in which they do not take advantage of their comparative advantage over robots,⁶ so there is great potential to create new professions if institutions and individuals take advantage of this opportunity.⁷ Robots have a great capacity for logic and handling big data but inspiration, intuition and creativity are far beyond their scope.⁸

Technological improvements provide the chance to enrich society as a whole but, apart from technological potential, there are important economic factors determining their adoption and impact on society. On the one hand companies will adopt technology only if it is cheap enough. For example, in the last few decades the reduction in the cost of computers has led to workers with intermediate skills being replaced when they carried out repetitive tasks that are easy to specify in an algorithm, contributing to the polarisation of the labour market and increased inequality.⁹ This leads us to another relevant economic aspect: the distribution of new wealth. Our data indicate a negative correlation between the likelihood of a profession being automated and its annual median wage, suggesting a possible increase in inequality in the short term.

In the long term, in a world where robots were capable of carrying out absolutely

all tasks, the distribution of income and wealth –rather than resource scarcity– would be the main raison d'être for economists.¹⁰ If such a profession exists in the future.

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1. See also the article «Automation: the dread of workers», in this Dossier.
2. McKinsey & Company (2015), «Four fundamentals of workplace automation», McKinsey Quarterly, November 2015. Breaking down each task into multiple capabilities (e.g. for the task «receiving clients» one needs capabilities such as the perception and transmission of emotions), they evaluate the percentage of capabilities involved in each task that current technology is able to reproduce.
3. Frey, C. and Osborne, M. (2013), «The Future of Employment: How Susceptible Are Jobs to Computerisation?», Working Paper.
4. For example, it is much more difficult to program a robot to find a book in a back room (unstructured environment) than on the organised shelves of an Amazon warehouse.
5. A group of robotics researchers, brought together by Oxford University, analysed 70 professions and assigned to each case a probability of 1 if they thought that all the tasks of the profession in question could be carried out with the most advanced technology we have today, and 0 in any other case. They then extrapolated this classification to a universe of 702 occupations with a probability-based model of allocation based on nine variables describing the degree of perception, manipulation, creativity and social intelligence required to carry out each task within an occupation.
6. McKinsey's report estimates that, at present, only 4% of jobs in the US are demanding in terms of creativity.

7. See also the article «How to take advantage of the positive impact of technological change on employment?» and «The unavoidable metamorphosis of labour market: how can education help?» in this Dossier.

8. See Autor, D. H. (2015), «Why Are There Still So Many Jobs?», Journal of Economic Perspectives, page 3-30.

9. See also the article «How to take advantage of the positive impact of technological change on employment?» in this Dossier.

10. See also Keynes, J. M. (1930), «The Economic Possibilities for our Grandchildren». In such a world moral principles would be redefined and deciding what to do with our lives, free from material restrictions, would be the biggest challenge we would face.



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